but when the zenith distance is greater than 80°, the author considers the accuracy of the French table questionable, both on account of the hypothetical law of the densities, and because the quantity assumed for the horizontal refraction is uncertain.

After giving a few examples, illustrative of the use of the new table, the author inquires how far the refractions are likely to be affected by the term which it was found necessary to leave out, because the present state of our knowledge of the phenomena of the atmosphere made it impossible to determine the coefficient by which it is multiplied. For this purpose, the variable part of that term has been computed for every half degree, from 85° to 88°, and the results are exhibited in a table. From this it appears, that this coefficient, although considerably less than that of the preceding term, may still have some influence on the refractions at very low altitudes. The mean refraction in Bessel's table, and in the new table, can hardly be supposed to differ 2″ from the true quantity, which would limit the coefficient in question to be less than one-tenth. It is a matter of some importance to obtain a near value of this coefficient; and it is probable that this can be accomplished in no other way, than by searching out such values of the two coefficients as will best represent many good observed refractions at altitudes less than 5°. If such values were found, our knowledge of the decrease of heat in ascending in the atmosphere would be improved, and the measurement of heights by the barometer would be made more perfect.

At the end of the paper is given a table of mean refractions for the temperature 50° Fahr. and barometric pressure 30 inches, at every degree from 0° to 70° zenith distance, and at every 10′ from 70° to the horizon; and tables of the corrections requisite for variations of the thermometer and barometer are subjoined.

May 31, 1838.

DAVIES GILBERT, Esq., V.P., in the Chair.

The Rev. John Hymers was duly elected a Fellow of the Society.

A paper was read, entitled, "Remarks on the Theory of the Dispersion of Light, as connected with Polarization." By the Rev. Baden Powell, M.A., F.R.S., Savilian Professor of Geometry in the University of Oxford.

The present paper is a sequel to those already presented by the author to the Royal Society, in which he had instituted a comparison of the observations of the refractive indices for the standard rays of light in various media, with the results calculated from theoretical formulæ, deduced from the most improved views of the undulatory hypothesis; the cases discussed including the greatest range of data as yet furnished by experiment. The comparison exhibited an accordance sufficient to warrant the conclusion that the theory af-

fords a very satisfactory approximation, at least, to the expression and explanation of the actual law of nature. In order, however, to remove any possible discrepancy which may still exist, or hereafter be found to obtain, the author considers that further examination is requisite of the principles on which any extension or modification of the theory might be pursued; and such is the object of the investigation undertaken in the present paper.

The phenomena of interference, on which the undulatory theory was originally based by Dr. Young, obliged us to adopt some idea of an alternating motion, as well as a motion of translation, in our conception of light; and this, with all the accessions it has received, especially from the investigation of Fresnel, has, at the present day, been connected by the labours of M. Cauchy and others, with general dynamical principles, which regulate the propagation of vibratory motions through an elastic medium. From such dynamical principles there have been deduced certain differential equations of motion, the integration of which gives the well-known expression for a wave, involving the relation between the velocity and the wave-length which explains the dispersion. The direct and complete integration of these forms, effected by M. Cauchy, and simplified by Mr. Tovey and M. Kelland, involves certain conditions; namely, the evanescence of certain terms, the interpretation of which implies peculiar views of the constitution of the ether. Mr. Tovey shows that without these conditions, a certain form of the wave-function is a particular solution of the equations; and this form is precisely that expressing elliptically polarized light. If the absence of the condition in question be essential to the case of elliptically and circularly polarized light, it follows that all the preceding investigations, which depend on the fulfilment of those conditions, are applicable only to unpolarized and plane-polarized light, and consequently the general integration is limited in a most material part of its application; a defect which is only remedied by the supplementary investigation of Mr. Tovey, in which, for this case, a particular solution is assigned. It seemed, then, necessary to show explicitly that the non-fulfilment of the conditions, that is, the non-evanescence of the terms in question, is essential for elliptically polarized light, as their evanescence is for common light, and thus to exhibit distinctly the relation between the cases of elliptically polarized, of plane-polarized, and unpolarized light; and, again, to remove, if possible, the obscurity and discrepancy of opinion in which the physical interpretation of those conditions, with regard to the supposed constitution of the ethereal medium, appeared to be involved.

The author then enters upon the analytical investigation of the subject, and in conclusion remarks that when light is elliptically or circularly polarized, that is, when any one of the two component vibrations is retarded behind the other, then, in the differential equations of motion, the opposite terms do not destroy each other in the summation, which they can only do in general by supposing a great number taken into account; that is, the number of terms is limited, or the sphere of the influence of the force by which the vibrations

are propagated is small. When light is plane-polarized, or unpolarized, that is, when there is no retardation, or the phases of the component vibrations are simultaneous, then the opposite sums destroy each other; that is, the number of terms involved is greater, or the sphere of the influence of the force greater. Since both kinds of light can be propagated indifferently through ordinary media, it follows that the sphere of influence of the force, or number of molecules taken into account, does not here depend on the arrangement of the molecules of ether in the medium, but on the retardation of one of the vibrations behind the other, or the absence of it, originally impressed on the ray in the respective cases.

A paper was also read, entitled, "An Experimental Inquiry into the influence of Nitrogen on the Growth of Plants." By Robert Rigg, Esq. Communicated by the Rev. J. B. Reade, M.A., F.R.S., &c.

The author, after briefly alluding to a former paper laid before the Royal Society, describing the chemical changes which occur during the germination of seeds, and some of the decompositions of vegetable matter, proceeds, in the present paper, to trace a connexion between the phenomena exhibited during the growth of plants, and the direct agency of nitrogen. The experiments by which the author supports his views are arranged in separate tables, so drawn out as to indicate not only the quantities of carbon, oxygen, hydrogen, nitrogen, and residual matter, in about 120 different vegetable substances, but also the quantity of nitrogen in each compound, when compared with 1000 parts by weight of carbon in the same substance. The most important of these tables are those which exhibit the chemical constitution of the germs, cotyledons and rootlets of seeds; the elements of the roots and trunks of trees, and the characters of the various parts of plants, especially of the leaves, at different periods of their growth. From this extensive series, which is stated to form but a small portion of the experiments made by the author in this department of chemical research, it appears that nitrogen and residual matter are invariably the most abundant in those parts of plants which perform the most important offices in vegetable physiology; and hence the author is disposed to infer, that nitrogen (being the element which more than any other is permanent in its character) when coupled with residual matter, is the moving agent, acting under the living principle of the plant, and moulding into shape the other elements. The method of ultimate analysis adopted by the author, enables him, as he conceives, to detect very minute errors, and therefore to speak with certainty as to the accuracy and value of every experiment.

A paper was also read, entitled, "Researches in Rotatory Motion." By A. Bell, Esq. Communicated by the Rev. W. Whewell, M.A., F.R.S., &c.

This paper, which is altogether analytical, contains several new theorems in rotatory motion, respecting the effect of the centrifugal force arising from a rotation about any axis, in producing rotation